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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/642,765	Applicant(s) TAUGUCHI ET AL.	
	Examiner Colleen P Cooke	Art Unit 1725	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 September 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☒ Claim(s) *5* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Response to Arguments

Applicant's arguments filed 9/19/02 have been fully considered but they are not persuasive.

Regarding the objection to claim 5 as a substantial duplicate of claim 4, the applicant argues that "claim 4 could read on a solder paste which does not contain an Sn-Ag-Cu alloy powder" but the examiner fails to see how this is so. Claim 4 depends from claim 3 and thus includes all the limitations of this claim, including the limitation that each Sn alloy powder has certain mass percentages of Ag, Cu, and Sn AND that the metals powders when melted have certain mass percentages of Ag and Cu with a remainder of Sn. This only allows for Ag, Cu and Sn in the final product. Claim 4 further requires two Sn alloy powders having the same components but in different proportions. Claim 3 has already established that Ag, Cu, and Sn must all be present. Thus, although claim 4 does not explicitly require Sn alloy powders having these components, claim 4 would be appear to be limited only to Sn-Ag-Cu alloys as these are the only alloys that will satisfy the requirements of claim 3 as well.

Art Rejection 1

The first argument presented to this rejection concerns claim 1 and the limitation of "less than 3 mass% Cu" as being obvious over a teaching by Paruchuri of a Cu content of 3-10%. The applicant does not argue the teachings regarding the Ag or Sn content, nor that the paste of Paruchuri meets the requirements of being a mixture of different metal powders as claimed, but only that it does not meet the specific Cu content of the claim. The applicant argues that the Office Action inappropriately relies upon *Titanium Metals Corp v. Banner,* 227 USPQ 773 (Fed.

Cir., 1985) because "the claimed composition in *Titanium Metals* had values for Mo and Ni falling squarely within the ranges for those elements implied by the reference" and in this case the claimed range falls outside the range in the reference. However, in the case of *Titanium Metals*, claims 1 and 2 were rejected under 35 USC 102 while claim 3 was rejected under 35 USC 103 and applicant has cited that portion of the case regarding the rejection made under 102 of claims 1 and 2. This is not relevant to the rejection at hand, made under 103 and not 102. The decision regarding claim 3 in *Titanium Metals*, drawn to a specific alloy not taught in the reference and rejected under 103, is relevant.

> Little more need be said in support of the examiner's rejection of claim 3, affirmed by the board, on the ground that its more specific subject matter would have been obvious at the time the invention was made from the knowledge disclosed in the reference.
> As admitted by appellee's affidavit evidence from James A. Hall, the Russian article discloses two alloys having compositions very close to that of claim 3, which is 0.3% Mo and 0.8% Ni, balance titanium. The two alloys in the prior art have 0.25% Mo - O.75% Ni and 0.31% Mo - 0.94% Ni, respectively. The proportions are so close that prima facie one skilled in the art would have expected them to have the same properties. Appellee produced no evidence to rebut that prima facie case. The specific alloy of claim 3 must therefore be considered to have been obvious from known alloys.

Next applicant argues with respect to claim 17 that the reference gives an example where soldering is carried out in an oven with a thermal profile such that the primary powder melts and the additive powder does not, except for a certain amount of dissolution. Whether or not all of the powders in the paste melt depends upon the thermal profile chosen and certainly all of the powders in the paste taught by Paruchuri would melt in the proper thermal profile. No specific thermal profile is claimed so it is not apparent that the applicant has a method of soldering using the claimed paste that is any different from using the paste of Paruchuri for the same soldering. The paste of Paruchuri is the same as that which is encompassed by claim 1, that is an alloy

powder mixed with an elemental powder, and if the applicant's alloy and elemental powder would melt during a certain thermal treatment, the alloy and elemental powder of Paruchuri would necessarily do the same.

Art Rejection 2

The first argument presented to this rejection concerns the limitation of "less than 3 mass% Cu" as being obvious over a teaching by Paruchuri of a Cu content of 3-10%, in view of Sakai's teachings of 0.1-2% Cu. The applicant does not argue the teachings regarding the Ag or Sn content, nor that the paste of Paruchuri meets the requirements of being a mixture of different metal powders as claimed, but only that it does not meet the specific Cu content of the claim.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, it would be obvious to use the Sn alloy powder of Sakai in place of or in combination with that of Paruchuri as Sakai teaches this alloy has enhanced mechanical properties, specifically thermal fatigue (Column 1, lines 65-67 and also Column 5, lines 1-3) and Paruchuri was concerned with the mechanical properties of the solder, fatigue resistance specifically as applicant has pointed out. Furthermore, applicant argues that Sakai is "silent about copper having any advantageous effect on fatigue strength." However, this is irrelevant as Sakai

does not need to specifically teach that copper improves the fatigue strength in order for the references to be properly combinable nor for the rejection itself to be proper. The fact that the applicant has discovered another advantage to the alloy of Sakai does not make the alloy patentable. In additional, Sakai does teach that the "small amount" of Cu improves junction strength (Column 4, lines 61-63), a mechanical property.

The applicant next argues with regards to claim 3 that Paruchuri does not teach mixing a tin-silver alloy with a tin-silver-copper alloy of a tin-copper alloy, in spite of the cited section of Paruchuri (Column 5, lines 8-12). The applicant attempts to support this argument by discussing the semantics of "combinations thereof" as distinct over "alloy" of powders. The applicant further states that there is no specific example in Paruchuri using more than one alloy. The teachings of Paruchuri, however, are not limited to the specific examples given, and the teaching of "a primary powder of tin-silver alloy or tin-lead-silver alloy, and an additive powder of tin, lead, silver, nickel, copper, or bismuth, or combinations thereof" would encompass a tin-silver alloy and a tin-silver-copper alloy or tin-copper alloy regardless of whether there are specific examples as such.

The applicant then argues with respect to claims 9 and 10 that the cited references do not teach or suggest the reflow soldering temperatures claimed. To this end, the applicant agrees that the melting point of the solder is 237-245°C but that reflow soldering of solder paste is "usually" carried out at a reflow temperature 40-50° higher than the melting point. The applicant provides no teaching in any of the references nor in his own disclosure to this effect, nor is this feature claimed. The fact remains that as the melting point is as described, the solder paste could in fact be reflowed at this temperature, as reflowing need only be at or above the melting temperature.

The applicant further argues regarding claim 18 essentially the same argument as applied to claim 17 above and the same rebuttal applies.

Art Rejection 3

The first argument presented to this rejection concerns the limitation of "less than 3 mass% Cu" as being obvious over a teaching by Paruchuri of a Cu content of 3-10%, in view of Hitch's teachings of a specific example having 0.67%Cu. The applicant does not argue the teachings regarding the Ag or Sn content, nor that the paste of Paruchuri meets the requirements of being a mixture of different metal powders as claimed, but only that it does not meet the specific Cu content of the claim.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, it would be obvious to use the Sn alloy powder of Hitch in place of or in combination with that of Paruchuri as Hitch teaches this alloy has enhanced mechanical properties, specifically fatigue life (page 2, lines 18-22) and Paruchuri was concerned with the mechanical properties of the solder, fatigue resistance specifically as applicant has pointed out. Applicant argues that Hitch only discusses these properties in relative terms and that Hitch never gives any reason why the copper content is within specified range. This is irrelevant. Hitch does

not need to quantify results nor specifically teach that the copper content copper improves the fatigue strength in order for the references to be properly combinable nor for the rejection itself to be proper. Hitch describes the alloy having 0.67Cu as "Best of alloys shown" in fatigue testing and further that corrosion results are "Very good" and solderability "Excellent".

Regarding claim 3, the applicant present substantially the same argument as above and the same rebuttal applies.

Regarding claims 9 and 10, the applicant present substantially the same argument as above and the same rebuttal applies.

Regarding claims 17 and 18, the applicant presents substantially the same argument as applied to claim 17 above and the same rebuttal applies.

Art Rejections 4 and 5

The applicant first argues that Seelig does not teach a Sn-Ag-Cu alloy as an alternative to prior art solder alloys containing lead and bismuth, such as that disclosed by Kazem-Goudarzi and that antimony is an essential element of Seelig so there is no motivation to remove it. However, first the examiner would question whether 0.2-2.0% antimony in an alloy having only 4 components would make antimony an essential element in the solder composition. This point aside, three references are used in this rejection. Seelig is not relied upon to teach a final solder composition. Seelig is relied upon to show that removal of lead and bismuth is desirable in the solder alloy art. The fact that Seelig includes a small percentage of antimony is remedied by the fact that the tertiary reference in each rejection teaches an alloy having desirably improved properties and has no antimony. Such teaching amounts to teaching that removing the antimony

still results in a desirable or improved solder alloy. Furthermore, Seelig does not teach any significance or importance of the antimony and Kazem-Goudarzi clearly states that antimony is often present only as an impurity (Column 1, lines 30-31).

The applicant goes on to claim that the alloys of Sakai and Hitch do not have "melting points sufficiently different" from each other to permit them to be used in Kazem-Goudarzi. However, there is no teaching of such a "sufficient difference" in Kazem-Goudarzi, and indeed the claim requires only that one solder have a greater liquidus temperature than the other. As both tertiary references teach acceptable ranges of composition and the liquidus temperature would vary over this compositional range, the requirement would be met in that one would be greater than another.

Regarding claims 9 and 10, the applicant present substantially the same argument as above and the same rebuttal applies.

Claim Objections

Applicant is advised that should claim 4 be found allowable, claim 5 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-2 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paruchuri et al. (5928404).

With respect to claims 1 and 2, Paruchuri et al. teaches a lead-free solder paste including a 96.5% tin- 3.5% silver alloy powder mixed with 3-10% elemental copper (Column 3, lines 59-65), and also a flux (see Column 3, lines 23-24). Although Paruchuri et al. does not teach using less than 3% copper as claimed, the prior art range is so close that one skilled in the art would have expected it to have the same properties. *Titanium Metals Corp. v. Banner,* 227 USPQ 773.

With respect to claims 17, 21, and 22, Paruchuri et al. teaches that the solder paste is printed onto a board, an electronic component is placed in the paste, and the assembly is heated to a temperature sufficient to cause the powder to melt and flow (Column 3, lines 23-29). Furthermore, Paruchuri et al. teaches that the composite solder paste may be printed and then reflowed (Column 7, lines 60-61). This may be done at any temperature sufficient to reflow the solder, including that which would melt the powders.

Claims 1-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paruchuri et al. (5928404), in view of Sakai et al. (6077477).

With respect to claims 1,2, and 13, Paruchuri et al. teaches a lead-free solder paste including a 96.5% tin- 3.5% silver alloy powder mixed with 3-10% elemental copper (Column 3, lines 59-65, and also a flux (see Column 3, lines 23-24). Paruchuri et al. does not teach a solder paste having less than 3% copper. Sakai et al. teaches a lead-free solder alloy having 92-97% Sn, 3-6% Ag and 0.1-2% Cu (Column 2, lines 20-24). This teaching is also emphasized in embodiment 1, shown in Table 1 (Column 3), which has 94.5% Sn, 5% Ag, and 0.5% Cu. Paruchuri et al. and Sakai et al. are analogous art because they are from the same field of endeavor, which is soldering. It would have been obvious to modify the solder paste of Paruchuri et al. by including an amount of copper less than 3% because as Sakai et al. teaches a solder joint having this small amount of copper has enhanced mechanical properties (Column 2, lines 28-30).

With respect to claims 17, 18, and 21-24, Paruchuri et al. teaches that the solder paste is printed onto a board, and electronic component is placed in the paste, and the assembly is heated to a temperature sufficient to cause the powder to melt and flow (Column 3, lines 23-29). Furthermore, Paruchuri et al. teaches that the composite solder paste may be printed and then reflowed (Column 7, lines 60-61). This may be done at any temperature sufficient to reflow the solder, including that which would melt the powders.

With respect to claims 3-7 and 14-15, Paruchuri et al. teaches that a solder is made by mixing a tin-silver alloy with "an additive powder of tin...silver...copper...or combinations thereof (Column 5, lines 8-12)". Thus, the mixing of a tin-silver alloy with a tin-silver-copper alloy or a tin-copper alloy are envisioned by the teachings of Paruchuri et al. Paruchuri et al. does not teach the specific solder composition of the claim. Sakai et al. teaches a lead-free solder

alloy having 92-97% Sn, 3-6% Ag and 0.1-2% Cu (Column 2, lines 20-24). This teaching is also emphasized in embodiment 1, shown in Table 1 (Column 3), which has 94.5% Sn, 5% Ag, and 0.5% Cu. Paruchuri et al. and Sakai et al. are analogous art because they are from the same field of endeavor, which is soldering. It would have been obvious to modify the solder paste of Paruchuri et al. by including an amount of copper less than 3% because as Sakai et al. teaches a solder joint having this small amount of copper has enhanced mechanical properties (Column 2, lines 28-30). It would have been obvious to modify the solder paste of Paruchuri et al. to the compositional teachings of Sakai et al. because as Sakai et al. teaches a solder joint having this composition has enhanced properties (Column 2, lines 25-30).

With respect to claims 8, 11, 12, 16, and 19-20, Paruchuri et al. teaches that the solder paste is printed onto a board, and electronic component is placed in the paste, and the assembly is heated to a temperature sufficient to cause the powder to melt and flow (Column 3, lines 23-29). Furthermore, Paruchuri et al. teaches that the composite solder paste may be printed and then reflowed (Column 7, lines 60-61). This may be done at any temperature sufficient to reflow the solder, including that which would melt the powders.

With respect to claims 9-10, the reflow temperature is a property of the solder used. The composition, as taught by Sakai et al., has a melting point of 237-245°C (Column 3, Table 1).

Claims 1-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paruchuri et al. (5928404), in view of Hitch et al. (WO 97/09455).

With respect to claims 1,2, and 13, Paruchuri et al. teaches a lead-free solder paste including a 96.5% tin- 3.5% silver alloy powder mixed with 3-10% elemental copper (Column 3,

lines 59-65), and also a flux (see Column 3, lines 23-24). Paruchuri et al. does not teach a solder paste having less than 3% copper. Hitch et al. teaches a lead-free solder alloy having 93.8-96.4% Sn, 3.1-3.5% Ag and 0.5-2.7% Cu (page 2, lines 24-25). This teaching is also emphasized in example alloys 1, 2, and 3 on pages 3-4 which teach compositions of 95.8Sn-3.5Ag-0.67Cu (described as the superior alloy), 94.0Sn-4.5Ag-1.5Cu, and 94.3An-5.0Ag-0.7Cu respectively. Paruchuri et al. and Hitch et al. are analogous art because they are from the same field of endeavor, which is soldering. It would have been obvious to modify the solder paste of Paruchuri et al. by including an amount of copper less than 3% because as Hitch et al. teaches a solder joint of this composition has superior properties.

With respect to claims17, 18, and 21-24, Paruchuri et al. teaches that the solder paste is printed onto a board, and electronic component is placed in the paste, and the assembly is heated to a temperature sufficient to cause the powder to melt and flow (Column 3, lines 23-29). Furthermore, Paruchuri et al. teaches that the composite solder paste may be printed and then reflowed (Column 7, lines 60-61). This may be done at any temperature sufficient to reflow the solder, including that which would melt the powders.

With respect to claims 3-7 and 14-15, Paruchuri et al. teaches that a solder is made by mixing a tin-silver alloy with "an additive powder of tin…silver…copper…or combinations thereof (Column 5, lines 8-12". Thus, the mixing of a tin-silver alloy with a tin-silver-copper alloy or a tin-copper alloy are envisioned by the teachings of Paruchuri et al. Paruchuri et al. does not teach the specific solder composition of the claim. Hitch et al. teaches a lead-free solder alloy having 93.8-96.4% Sn, 3.1-3.5% Ag and 0.5-2.7% Cu (page 2, lines 24-25). This teaching is also emphasized in example alloys 1, 2, and 3 on pages 3-4 which teach compositions of

95.8Sn-3.5Ag-0.67Cu (described as the superior alloy), 94.0Sn-4.5Ag-1.5Cu, and 94.3An-5.0Ag-0.7Cu respectively. Paruchuri et al. and Hitch et al. are analogous art because they are from the same field of endeavor, which is soldering. It would have been obvious to modify the solder paste of Paruchuri et al. to the composition of Hitch et al. because as Hitch et al. teaches a solder joint of this composition has superior properties.

With respect to claims 8, 11, 12, 16, and 19-20, Paruchuri et al. teaches that the solder paste is printed onto a board, and electronic component is placed in the paste, and the assembly is heated to a temperature sufficient to cause the powder to melt and flow (Column 3, lines 23-29). Furthermore, Paruchuri et al. teaches that the composite solder paste may be printed and then reflowed (Column 7, lines 60-61). This may be done at any temperature sufficient to reflow the solder, including that which would melt the powders.

With respect to claims 9-10, the reflow temperature is a property of the solder used. The compositions, as taught by Hitch et al., has a melting point of 213-218°C, 214-21°C, and 214-216°C respectively for alloys 1, 2, and 3 (pages 3-4).

Claims 3-12, 14-16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kazem-Goudarzi et al. (5540379), in view of Seelig et al. (5352407), and further in view of Sakai et al. (6077477).

With respect to claims 3-7 and 14-15, Kazem-Goudarzi et al. teaches a solder paste made from two different tin alloy powders, which in a preferred embodiment are a Sn-Pb-Ag alloy powder and a Sn-Pb-Bi alloy powder (Columns 3-4, lines 65-7). Kazem-Goudarzi et al. goes on to teach "alloys of elements such as tin…copper…silver may also be used" (Column 4, lines 27-

29). Kazem-Goudarzi et al. does not specifically teach the Sn-Ag-Cu compositions claimed. Seelig et al. teaches removing lead and bismuth from solder alloys as lead is toxic (Column 1, lines 29-34) and generates hazardous waste, while bismuth is mined from lead ore and is not abundantly available (Column 1, lines 48-59). Seelig et al. goes on to teach that such a lead-free, bismuth-free solder would include tin, silver, and copper (Column 2). Seelig et al. does not, however, teach specifically the Sn-Ag-Cu compositions claimed. Sakai et al. teaches a lead-free solder alloy having 92-97% Sn, 3-6% Ag and 0.1-2% Cu (Column 2, lines 20-24). This teaching is also emphasized in embodiment 1, shown in Table 1 (Column 3), which has 94.5% Sn, 5% Ag, and 0.5% Cu.

Kazem-Goudarzi et al., Seelig et al., and Sakai et al. are analogous art because they are from the same field of endeavor, which is soldering. It would have been obvious to modify the dual alloy paste of Kazem-Goudarzi et al. by using alloys of tin with copper and/or silver to arrive at a final composition such as that taught by Sakai et al. because Seelig et al. teaches removing the lead and bismuth and using Sn-Ag-Cu instead, while Sakai et al. teaches that the specific Sn-Ag-Cu compositions exhibit superior properties.

With respect to claims 8, 11, 12, 16, 18, 19-20, and 23-24, Kazem-Goudarzi et al. teaches that the dual alloy solder paste is printed onto a PCB and reflowed (Column 4, lines 34-47). Although Kazem-Goudarzi et al. does not specifically refer to reflow soldering a surface mounted device or a chip component, the processing of the paste as described is known to be used for exactly that purpose. This may be done at any temperature sufficient to reflow the solder, including that which would melt the powders, and in fact exactly that is done in the second heating step, which is a single heating step.

With respect to claims 9-10, the reflow temperature is a property of the solder used. The composition, as taught by Sakai et al., has a melting point of 237-245°C (Column 3, Table 1).

Claims 3-12, 14-16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kazem-Goudarzi et al. (5540379), in view of Seelig et al. (5352407), and further in view of Hitch et al. (WO 97/09455).

With respect to claims 3-7 and 14-15, Kazem-Goudarzi et al. teaches a solder paste made from two different tin alloy powders, which in a preferred embodiment are a Sn-Pb-Ag alloy powder and a Sn-Pb-Bi alloy powder (Columns 3-4, lines 65-7). Kazem-Goudarzi et al. goes on to teach "alloys of elements such as tin…copper…silver may also be used" (Column 4, lines 27-29). Kazem-Goudarzi et al. does not specifically teach the Sn-Ag-Cu compositions claimed. Seelig et al. teaches removing lead and bismuth from solder alloys as lead is toxic (Column 1, lines 29-34) and generates hazardous waste, while bismuth is mined from lead ore and is not abundantly available (Column 1, lines 48-59). Seelig et al. goes on to teach that such a lead-free, bismuth-free solder would include tin, silver, and copper (Column 2). Seelig et al. does not, however, teach specifically the Sn-Ag-Cu compositions claimed. Hitch et al. teaches a lead-free solder alloy having 93.8-96.4% Sn, 3.1-3.5% Ag and 0.5-2.7% Cu (page 2, lines 24-25). This teaching is also emphasized in example alloys 1, 2, and 3 on pages 3-4 which teach compositions of 95.8Sn-3.5Ag-0.67Cu (described as the superior alloy), 94.0Sn-4.5Ag-1.5Cu, and 94.3An-5.0Ag-0.7Cu respectively.

Kazem-Goudarzi et al., Seelig et al., and Hitch et al. are analogous art because they are from the same field of endeavor, which is soldering. It would have been obvious to modify the

dual alloy paste of Kazem-Goudarzi et al. by using alloys of tin with copper and/or silver to arrive at a final composition such as that taught by Hitch et al. because Seelig et al. teaches removing the lead and bismuth and using Sn-Ag-Cu instead, while Hitch et al. teaches that the specific Sn-Ag-Cu compositions exhibit superior properties.

With respect to claims 8, 11, 12, 16, 18, 19-20, and 23-24, Kazem-Goudarzi et al. teaches that the dual alloy solder paste is printed onto a PCB and reflowed (Column 4, lines 34-47). Although Kazem-Goudarzi et al. does not specifically refer to reflow soldering a surface mounted device or a chip component, the processing of the paste as described is known to be used for exactly that purpose. This may be done at any temperature sufficient to reflow the solder, including that which would melt the powders, and in fact exactly that is done in the second heating step, which is a single heating step.

With respect to claims 9-10, the reflow temperature is a property of the solder used. The compositions, as taught by Hitch et al., has a melting point of 213-218°C, 214-21°C, and 214-216°C respectively for alloys 1, 2, and 3 (pages 3-4).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this or earlier communications from the examiner should be directed to Colleen Cooke, whose telephone number is 703-305-1136. She can normally be reached Monday-Thursday from 7:15-5:45pm.

If attempts to reach the examiner by telephone are unsuccessful, her supervisor, Thomas Dunn, can be reached at 703-308-3318. The official fax number for the organization where this application or proceeding is assigned is 703-305-6078. The unofficial fax number for this examiner is 703-746-3048.

Any inquiry of a general nature relating to the status of this application or proceeding should be directed to the receptionist, whose telephone number is 703-308-0661.

CPC 10/15/2002

Tom Dunn

TOM DUNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700